NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

SOIL SALINITY MANAGEMENT – NONIRRIGATED (ACRE)

CODE 571

DEFINITION

Management of land, water, and plants to control excess sub-surface soil water and minimize accumulations of salts on the soil surface and in the root zone of nonirrigated saline seep areas.

PURPOSE

This practice may be applied as part of a resource management system to promote desired plant growth in nonirrigated saline seep areas.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to nonirrigated land where (a) human-induced soil salinity is at or approaching a level that adversely affects intended land use; or, (b) a combination of factors including topography, soils, geology, precipitation, vegetation, farm management systems, and land use indicate the future probability of increased soil salinity in saline seep areas.

This standard does not apply to saline or saline-sodic conditions related to or induced by irrigation.

CRITERIA

Corrective measures must comply with Federal, State, and local water quality laws, ordinances, and regulations.

A nonirrigated Soil Salinity Management Plan shall be developed to solve the salinity problem. The Soil Salinity Management Plan will document the development, extent, and planned management of the recharge and saline seep areas. Required components of a plan are listed in the Plans and Specifications section of this standard.

Plant and/or maintain adapted high water use vegetation in the recharge area(s) to utilize excess soil water and minimize soil water movement to the saline seep area.

Apply practices such as no-till, strip-till, mulch-till, or deep tillage in the reclaimed saline seep area to increase infiltration and leaching to prevent capillary movement of water and salts into the root zone.

Use of fertilizers, pesticides and/or other chemicals shall not compromise the intended purpose.

Problem areas, including potential seep areas, must be identified by documenting symptoms of salt-affected soils including pH, EC (electro-conductivity), and the SAR (sodium absorption ratio).

Once a problem area or seep has been identified, the recharge area must be identified by an onsite investigation and recorded on a topographic map. Documentation of actual conditions must be made, preferably with the operator, including historical information concerning development of the seep, cropping and tillage system history of the suspected recharge area, precipitation data, soils data, ground water depth, etc.

Controlling Water in Recharge Area

Plant deep-rooted perennials such as alfalfa to dry the soil profile in the recharge area. Deep-rooted perennial forages should be seeded on a significant portion of the recharge area. The seeded area should include the acreage of highest water table elevation within the defined recharge area.

NRCS, MT
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Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard contact the Natural Resources Conservation Service.

NOTE: This type of font **(AaBbCcDdEe 123..)** indicates NRCS National Standards.
This type of font (AaBbCcDdEe 123..) indicates Montana Supplement.

When a saline seep has been identified and establishing permanent vegetation is not an option, annual cropping or flex cropping will be used starting with the acreage of highest water table elevation.

Select plants from TABLE 2 and 3 as a guideline to remove excess moisture from the recharge area. Establish vegetation according to procedures listed in the Field Office Technical Guide, (FOTG) Section IV—Practice Standards and Specifications, 512–Pasture and Hayland Planting and the Plant Materials Technical Note No. 26.

After groundwater has been removed from the recharge area, an intensive cropping system must be applied to prevent the buildup of new water. See "Flex Cropping" in the FOTG, Section IV—Practice Standards and Specifications, 328–Conservation Cropping Sequence. Crops should be grown in sequential order with increasing rooting depths, until the depth and amount of soil water removed exceeds soil water recharge.

A soil fertility program must be implemented if flex cropping or annual cropping is utilized to ensure a successful crop and maximizing the crops rooting ability and moisture extraction. See FOTG, Section IV—Practice Standards and Specifications, 590–Nutrient Management.

Establishing Plants in Saline Soils

An Electrical Conductivity (EC) test must be made of the plow layer or top few inches of the soil. This information is used to determine what plant materials can be established in the saline soil. See TABLE 4.

Soil sampling should be completed to determine appropriate species to establish. When collecting soil, it is important to combine several samples from various parts of a field to get an average sample. For example, in a homogeneous or uniform field, ten samples taken from different locations should be adequate. However, separate samples may be needed in distinct areas of concern. Depth of sampling is important. Saline soils should be sampled from 0–6 inches, 6–12 inches, and 12–24 inches. These three depth increments should be analyzed separately. Samples should be sent to qualified laboratories for analysis.

Establish vegetation in the saline area as soon as planting conditions allow controlling the buildup of salt on the soil surface.

Seed should be planted with a drill whenever possible. Wet soils may be planted by broadcasting after weed control has been successful. Wet sites may also be planted by drilling on frozen ground (frost seeding). Seeding rates should follow TABLE 5, Seeding Rates for Salinity Management. Undesirable vegetation must be controlled prior to vegetative establishment.

CONSIDERATIONS

Eliminate fallow periods in recharge areas to increase utilization of soil water and decrease infiltration.

Locate snow fences, windbreaks, vegetative filter strips and other structures that may accumulate snow, away from recharge areas.

If the water in constructed ponds or dugouts is seeping and/or has a high salt concentration, sealing the bottoms of these structures will minimize movement of this water to down gradient, saline seep areas.

Install underground outlets or waterways to drain storage terraces.

Plug artesian wells if they leak and contribute to subsurface water flows.

Roadways across natural drainageways can impede water flow and increase infiltration. Install or improve culverts to minimize the blocking of overland flow.

Plant cover or green manure crops in the recharge area to utilize excess soil water if the planned crop fails due to conditions such as poor stand establishment, hailstorms, winterkill, disease or insect damage.

Consider planting deep-rooted trees or shrubs in the recharge area to utilize excess soil water.

Planned actions should give first consideration to prevention rather than correction.

Where applicable, improve surface drainage in the recharge area.

Before reclaiming a saline seep, depth of the water table must be low enough to prevent salts from moving up by capillary action into the rooting zone. A general rule of thumb is that if the depth of water table in the saline soil exceeds 5 feet, reclamation procedures to remove salts from the root zone can proceed.

PLANS AND SPECIFICATIONS

Specifications for establishment and operation of this practice shall be prepared for each field or treatment unit according to the Criteria, Considerations, and O&M described in this standard.

Specifications shall be recorded using approved certification sheets, job sheets, narrative statements in the conservation plan, or other acceptable forms of documentation.

A **Nonirrigated Soil Salinity Management Plan** shall include the following components:

1. An onsite investigation report
2. A listing of conservation practices and their specs that are required to be installed to decrease the flow of water from the recharge area to the saline seep.
3. A listing of conservation practices and their specs that will be installed to reclaim the saline seep area(s).
4. Location map - field numbers and a map or sketch of the area including measured acres and identification of recharge and discharge area.
5. Date implementation is scheduled and applied.
6. The FOTG, Practice Specification 571–Soil Salinity Management– Nonirrigated.
7. List of types and extent of environmental and ecological monitoring and evaluation that may be necessary.

An **Onsite Investigation Report** identifies existing field conditions and documents supporting data for development of the Nonirrigated Soil Salinity Management Plan.

The onsite investigation report shall include information including soil tests, hydrographs, topographic maps, soils maps, geologic maps, historic photos, cropping and yield histories, pH, and EC (electrical conductivity) that document the development and extent of the saline seep and recharge area.

OPERATION AND MAINTENANCE

The following actions shall be identified in the plan and carried out to insure that this practice functions as intended throughout its expected life.

Operation—Identify any required items needed to assist in stand establishment such as mowing, burning, flash grazing and/or herbicides to control weeds. Address insect and disease control needs where they are likely to create establishment problems.

Maintenance—Any necessary replanting due to drought, insects or other uncontrollable events which prevented adequate stand establishment should be addressed as soon as possible. Recommendations may vary from complete re-establishment to overseeding or spot replanting.

Measures such as annual mowing, clipping, and removing excess vegetation must be completed to maintain vigorous growth for water use. Fertilize as necessary to invigorate growth.

If monitoring wells are installed, monthly elevations will be obtained on all investigation wells to assist in determining movement and source of groundwater. This will also aid in the identification of the recharge area. Monitoring should be completed until the water table levels are determined and then continued seasonally throughout the life of the practice until the seep is reclaimed.

REFERENCES

Halvorson, Ardell D. 1990. Management of Dryland Saline Seeps. p. 372-392. In Kenneth K Tanji (ed.) Agricultural Salinity Assessment and Management. ASCE, New York, N.Y.

Saline and Alkali Soils. Agriculture Handbook No. 60. USDA ARS. Richards, L. A., editor. August 1969.

Majerus, Mark. Plant Materials for Saline-Alkaline Soils. Plant Materials Technical Note No.26, Bridger Plant Materials Center, USDA–Natural Resources Conservation Service, 1996.

Brown, P. L., A. D. Halvorson, F.H. Siddoway, H. F. Mayland, and M. R. Miller, Saline-seep Diagnosis, Control, and Reclamation. USDA–Conservation Research Report No. 30. 1982.

Miller, M.R., P.L. Brown, J.J. Donavan, R.N. Bergantino, J.L. Sondregger, and F.A. Schmidt. Saline Seep Development and Control in the North American Great Plains: Hydrogeological Aspects. Agricultural Waste Management Journal, Vol. 4, p 115-141. 1981.

USDA–Natural Resources Conservation Service, Field Office Technical Guide, Section IV–Practice Standards and Specifications:

- 328–Conservation Cropping Sequence.
- 512–Pasture and Hayland Planting.